February 1990

FMP MONITORING AND ASSESSMENT WORKSHOP REPORT

Samuel G. Pooley

Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service, NOAA
Honolulu, Hawaii 96822-2396

ADMINISTRATIVE REPORT H-90-05

This Administrative Report is issued as an informal document to ensure prompt dissemination of preliminary results, interim reports, and special studies. We recommend that it not be abstracted or cited.

Southwest Fisheries Center Administrative Report H-90-05

FMP MONITORING AND ASSESSMENT WORKSHOP REPORT

Samuel G. Pooley
Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service, NOAA
Honolulu, Hawaii 96822-2396

February 1990

INTRODUCTION

This report presents the results of the FMP [Fishery Management Plan] Monitoring and Assessment Workshop, which was held on 6-9 November 1989 to improve the process of annually reviewing and assessing the fisheries that are subject to management by the Western Pacific Fishery Management Council (Council), particularly the fisheries for bottomfish and pelagic species. The motivation for the workshop is spelled out in the workshop's announcement (Fig. 1). The workshop originated through discussions at recent FMP planning team meetings concerning the problems in preparing the annual reports, and through the initiatives by the Council's staff on the question of an "indicator" approach to fishery monitoring. The workshop was organized as a facilitated planning session, but not as tightly structured as the typical planning workshops of the Southwest Fisheries Center (e.g., Mackett 1983). As a result, the workshop included a combination of technical presentations, open discussion, and interactive consensus methodologies.

The workshop's agenda (Fig. 2) consisted of three major segments: an introduction to basic assessment methodologies, a discussion of the fisheries for bottomfish and pelagic species, and the final work products and recommendations. The introduction included the perspectives of experts on stock assessments, discussion of the 1989 requirements of the National Marine Fisheries Service (NMFS) for threshold levels of fishery biomass, examination of fishery indicators as a better approach for synthesizing annual assessment information, and the identification of final products from the workshop. The discussion of the fisheries for bottomfish and pelagic species included the development of criteria for designing fishery indicators, and an examination of existing data sets for construction of the indicators. The conclusion to the workshop included an assessment by the workshop rapporteur, Thomas W. Polacheck of the NMFS Northeast Fisheries Center; recommendations for revising the annual reporting process; and a discussion of the steps required to follow up on the workshop's results.

One goal of the workshop was to develop a common understanding of the different perspectives taken by various participants in the annual review and assessment process. A common approach for the detailed elaboration of data reporting also was developed; it should serve to improve the information basis for future annual fishery reports. According to Polacheck, the participants from the western Pacific region showed a high degree of optimism and a positive attitude toward their tasks, but there was still much work to be done.

Workshop participants were provided a loose-leaf notebook containing basic background documents (agenda, threshold guidelines, annual report requirements, summary of the 1988 annual reports, a data inventory, synopsis of the interactive planning methodology, fishery regulations, examples of strategies for data needs, and a list of participants). The notebook grew during the workshop as various participants provided photocopied documents as additional background material.

The final products of the workshop will include the present report, a "plan of attack" that specifies the changes to the annual reporting and assessment process that need to be codified, and a document outlining the data needs. The latter two documents will be prepared by the Council's staff using the methods and materials introduced in the workshop.

CENTRAL RESULTS

The workshop generated a number of "internal" lists of priorities, as well as a process for and a commitment to improving the annual reports through the plan monitoring teams. It is impossible to replicate in a document the shared learning experience, but the central written results derived directly from the workshop include a list of criteria for fishery indicators (Table 1) and a list of preliminary recommendations (Table 2). They are described more fully in the Workshop Chronology, which follows this section, and are highlighted here to emphasize their importance.

WORKSHOP CHRONOLOGY

Monday, 6 November

The workshop participants were welcomed by Kitty Simonds, the executive director of the Council, who reiterated her enthusiasm for improving the fishery review and assessment process by pooling the best minds of those individuals actively involved in the process. The participants included eight NMFS scientists, as well as the moderator and rapporteur, three staff members from the Council, three from the Office of Marine Resources in American Samoa, two from the Division of Aquatic and Wildlife Resources in Guam, two from the Hawaii Division of Aquatic Resources, one from the Division of Fish and Wildlife in the Commonwealth of the Northern Mariana Islands (CNMI), and two university professors (Table 3). As the moderator for the workshop, I clarified the major "ground rules" for participation in the workshop: consensus methodologies that encourage equitable participation would be enforced.

The participants were then asked to identify their personal goals for attending the workshop: **"What do you want to get out of this 4-day workshop?"** (Table 4). The disparity in goals mirrored the various interests that prompted the workshop in the first place, but there was general concurrence that, even if there was no consensus on the objectives, the proposed agenda appeared to promise progress toward meeting many of them.

The perspectives of experts on stock assessment approaches included presentations by Jeffrey J. Polovina, leader of the Honolulu Laboratory's Insular Resources Investigation, on a recent South Pacific stock assessment workshop (Fig. 3; Polovina in prep.), and Thomas Polacheck on the assessment techniques used in the New England fisheries (Figs. 4-6).

The workshop considered the recent experiences of the participants in stock assessments and the annual fishery review process. The principal biologists who were engaged in stock assessments were asked to respond to the question **"What one main fact or idea about fishery monitoring and assessment would you like to communicate to this group, leading into the workshop sessions?"** (Table 5).

With this background, the workshop began to consider some of the specific details involved in the annual review process. Paul Bartram, consultant to the Council, outlined the indicator approach that he had pioneered for the Bottomfish FMP. Central to the indicator approach is to correlate the Council's basic missions to specific FMP objectives and to "focus annual FMP reviews on fishery concerns that might require management attention." These "concerns" would be reviewed on both a qualitative and quantitative basis to identify the level of action required by the Council.

The group proposed a number of "key features" of an indicator approach (Table 6); they were summarized as a list of criteria to be used in the subsequent days of the workshop (Table 1).

The NMFS recently promulgated new FMP guidelines (50 CFR 602) that require each plan to specify a threshold of biomass that will ensure that, from a recruitment point of view, overfishing will not occur. Three of the Council's FMP planning teams met the week preceding the workshop to develop approaches toward the threshold requirements. The planning team chairs summarized these decisions (Fig. 7), and there was a general discussion on the relationship between these thresholds and the type of stock assessment methodologies that might be appropriate for the annual review process.

The first day concluded with a discussion of the workshop's "products" (Table 7). In terms of the report on the workshop,

the consensus methodologies attempt to ensure equitable opportunities for contributions to the final results by the participants, but do not necessarily rank or evaluate those contributions. In most cases in this report, the lists do not rank the individual contributions. In only a few cases was a specific consensus sought, and these cases are identified. Recommendations for making concrete changes in the annual monitoring, assessment, and reporting requirements will be prepared by the FMP planning teams within the framework identified by the Council's forthcoming "plan of attack."

Tuesday, 7 November

The objective for the second and third days of the workshop was spelled out in the following addendum to the workshop agenda:

> The second and third day of this workshop will be a melding of the SWFC's interactive planning techniques and "hands-on" problem solving. We will concentrate on the Bottomfish FMP on Tuesday, and the Pelagic Species FMP on Wednesday. I am using the term "indicator" to represent the fishery performance data requirements identified in the FMP's. What is central to this concept is that data, data summaries, and data presentations must be related to the analytical or theoretical perspective in which they will be evaluated. Data are inputs into the analytical techniques which create indicators. The planning teams have discussed the existing annual report requirements extensively, and they probably will need to do so again. What we can hope to accomplish at this workshop is to develop a common understanding of the objectives, problems, and possibilities facing us in monitoring and assessing our fisheries. This is the only way to make progress in providing the "best available scientific information" to fishery managers.
>
> This should be a product oriented workshop by combining personal communication, education, training, and very specific contributions to the FMP monitoring and assessment processes. These 2 days should provide the basic raw material for two important documents: a "plan of attack" for organizing data and analytical resources and for recommending changes in FMP reporting and monitoring requirements, and a revised document on the data needs to identify what current and additional data collections are required to monitor these fisheries.
>
> Samuel G. Pooley, moderator

Initially, we believed that the workshop would be able to take a "hands-on" approach during these 2 days, integrating existing Western Pacific Fishery Information Network data from American Samoa, Guam, and the CNMI with proposed fishery indicators. However, it quickly became apparent that the process involved in defining these indicators simply and adequately would preclude such a thorough approach at this stage. Furthermore, Polovina's (in prep.) description of the South Pacific stock assessment workshop made clear that much more time, in terms of days or weeks, was required for that type of approach. Therefore, the FMP workshop participants decided to step through a number of indicators for the FMP's for bottomfish and pelagic species by using the key elements identified the previous day.

Tuesday began with a detailed, computer-aided presentation by two staff members of the Honolulu Laboratory: David A. Somerton, leader of the Fishery Enhancement and Dynamics Program, and Donald R. Kobayashi, research associate. Their presentation was on their simulation of bottomfish population structure under different levels of exploitation. The presentation identified some of shortcomings in the application of length-based approaches to stock assessment, particularly under nonequilibrium conditions. For example, Somerton showed that the presumed stock structure, based on sampling results and backcasting of size frequencies, might differ greatly from simulated results when parameters were held constant (Fig. 8; Somerton et al. 1989). The conclusion was that assessment of an individual fishery required substantial investment in understanding the underlying dynamics of the stocks as well as the sampling strategy that generated the empirical data on the fishery.

The workshop continued with a brief review of the existing Bottomfish FMP indicators, as revised by the previous week's planning team meeting (Table 8A). The planning team had chosen two biological indicators as possible candidates for the threshold definition of recruitment overfishing, coinciding with the spawning stock biomass indicator proposed by Somerton. The two indicators--the mean size of the catch compared with size at maturity and catch per unit effort compared with a baseline--were then reviewed with the indicator criteria. The workshop participants also explored a number of new indicators that might be applied to the Bottomfish FMP annual review (Table 8B). Although these new indicators were discussed in some detail at the workshop, they are not addressed fully here and, instead, will be explored in detail by the FMP planning teams. The conclusion to these investigations was that further work by the bottomfish planning team and by the fishery biologists in each area would be necessary to implement these indicators successfully.

As a part of the examination of the individual indicators, the participants were asked to describe briefly some key features of their fisheries. This process led to one rather startling revelation: Some of the background material in the 1988 bottomfish annual report, which had been summarized from existing agency data, was quite misleading because of problems in interpreting the data summaries (i.e., the problem related to the use of unexpanded sampling data). This prompted considerable discussion on the importance of placing data in context.

Wednesday, 8 November

Consideration of the pelagic species FMP review process followed the basic pattern of the bottomfish review, except that the pelagic species FMP does not contain indicators on which to base the discussion. Therefore, a central step for the pelagic species was the construction of a prioritized list of potential indicators using an interactive planning process called the **nominal group technique** (Table 9). As with the bottomfish indicators, these indicators were discussed in considerable detail at the workshop but are not described in detail in this report. Development of ideas for indicators into quantifiable measures that actually indicate conditions in a fishery is clearly difficult and time consuming, and this work will have to be continued by the pelagic plan monitoring team. However, two of the indicators were investigated in a more thorough manner at the workshop, and differences in approaches between areas were also considered.

Finally, the workshop participants groped toward a consensus on handling the annual reports. The basic annual report process is summarized:

Data + research ....> annual summaries and compilations.

Annual compilations ....> annual planning team meetings.

Annual planning team meetings ....> assessment and recommendations.

Planning team recommendations ....> Council for action.

Unfortunately, a number of steps in this process have bogged down. The participants were asked to respond to the question **"What do we need to do about the annual monitoring and reporting process?"** Their answers are listed in Table 10. The range of options is wide, and a central conclusion was for further discussion to be held by the plan monitoring teams to clarify their individual assessment needs. One central feature in the

annual review process is its relationship to the new NMFS requirement for a periodic (but not necessarily annual) SAFE report (i.e., a stock assessment and fishery evaluation report). Robert A. Skillman, leader of the Honolulu Laboratory's Pelagic FMP Research Program, pointed out that much of the repetitive material currently appearing in the annual reports could be placed in the SAFE report and then updated only as updating the SAFE report was required. In the meantime, however, the next "annual report" for each species might well be turned into the first SAFE report. Thereafter, part of the annual review for each fishery would involve a planning team conclusion concerning the need to update the SAFE report.

Thursday, 9 November

Thomas Polacheck, as the workshop rapporteur, highlighted a number of points, which are summarized in Table 11. The next steps in the process of improving the annual fishery assessments and reports include a detailed discussion of the workshop's results by the bottomfish and pelagic species plan monitoring teams and preparation by the Council's staff of the "plan of attack" and a document on data and research needs. Some of these points are summarized in Table 12.

REFERENCES

Mackett, D. J.
1983. Report of the workshop on long-range planning for the North Pacific albacore fishery. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFC-37, 53 p.

Polovina, Jeffrey J. (editor).
In preparation. Assessment workshop for the deepwater snapper resources in the Pacific islands, 5-26 July 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo.

Somerton, D. A., B. S. Kikkawa, and A. R. Everson.
1989. Biological assessment of the Hawaii bottom fish stocks and the Southeast Hancock Seamount armorhead stock, 1988. Southwest Fish. Cent. Admin. Rep. H-89-6, 34 p.

Table 1.--Criteria for fishery indicators.

1.	Which fishery management objective is related to this indicator? How?
2.	What underlying fishery dynamic is related to this indicator?
3a.	What method of analysis is applied to this indicator?
3b.	How do you measure this indicator?
4.	Do you have the data? For what time period, and how much coverage?
5.	Who should collect and compile these data?
6.	Who should be analyzing this indicator?
7.	How should this indicator be presented (displayed)?
8a.	What is a "critical value" for this indicator?
8b.	Who evaluates the significance of the indicator's value?
9a.	What statistical confidence levels can you expect for this indicator?
9b.	For indicators with low confidence levels, is this indicator nonetheless useful?
10.	What management measures are required when this indicator's critical value(s) is reached?

Table 2.--Workshop preliminary recommendations (not in any particular order).

1. Individual areas should be responsible for "number crunching" and preliminary assessments.

2. Planning team annual review meeting should be delayed until the modules are distributed. (Modules should be prepared earlier.)

3. Planning team annual reviews should be of extended duration (i.e., more than 1 day per FMP) to allow full time for discussion and analysis.

4. Elements for annual assessments should be prioritized, and deadlines established.

5. A draft ("straw") assessment report should be prepared before the planning teams meet.

6. Material to be presented to the Council should be streamlined (abbreviated).

7. Modules should be viewed as reference documents, with the actual annual reports being less than 10 pages in length.

8. A pre-annual review meeting should be held to identify major recommendations for Council action, with the actual annual report to be delayed until modules are completed.

9. The formal annual report should be produced much later in the year, that is, after allowing plenty of time for preparing assessments and the modules.

10. Modules should be made available to the planning teams in draft form, and there should be no requirement that individual modules be completed in a final "published" form.

11. The annual planning team review meeting should be considered the annual report, and its minutes be viewed as documentation of that report.

12. The modules should be compiled into a complete annual report, using planning team members, the Council's staff, or a professional editor.

13. Standard data and indicators elements should be identified.

Table 2.--Continued.

14.	The annual report should be the planning teams' description and assessment of the indicators, as well as any recommendations they may have for changes in the management of the fishery.
15.	The Council should either acknowledge that the annual reports are valuable to them in their deliberations, or the formal report requirements should be dropped. (Planning teams would send reports to the Council on an as-needed basis.)
16.	The various fishery agencies should make a stronger commitment to the annual report process.
17.	The annual reports should be "popularized" as reports to fishery participants.
18.	The Council should receive annual presentations on major research results for each fishery.
19.	Fishery performance data summaries should be incorporated into the existing "Fishery Statistics of the Western Pacific" (WPACFIN).
20.	Cooperative research, including exchange of scientists, should be encouraged between the state and territorial fishery agencies and the Honolulu Laboratory.
21.	The annual reports should contain (or be limited to) formal "testimony" on fishery conditions from planning team members.
22.	Annual reports should record the planning teams' "best judgment" about conditions in the fishery.

Table 3.--Workshop participants.

Agency	Participant
American Samoa Department of Marine and Wildlife Resources	Fini Aitaoto
	Peter Craig
	Bonnie Ponwith
Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife	Terry Donaldson
Guam Division of Aquatic and Wildlife Resources	Gerald Davis
	Robert Meyers
Hawaii Division of Aquatic Resources	Walter Ikehara
	Reggie Kokubun
National Marine Fisheries Service	George Boehlert
	Christofer Boggs
	David Hamm
	Alvin Katekaru
	John Naughton
	Thomas Polacheck, NEFC
	Jeffrey J. Polovina
	Sam Pooley
	Robert Skillman
	Dave Somerton
Western Pacific Fishery Management Council	Paul Bartram
	Dorothy Lowman
	Justin Rutka
	Kitty Simonds
Other	Paul Callaghan (University of Guam)
	Jim Parrish (University of Hawaii)

Table 4.--Objectives of the workshop participants.

1.	Speak as a biologist to other biologists.
2.	Identify the parameters for monitoring fisheries.
3.	Achieve consensus on contents of annual reports.
4.	Identify data requirements for annual reports.
5.	Develop quantitative monitoring criteria for fisheries.
6.	Achieve uniformity in information presented in annual reports.
7.	Become less frustrated with preparing annual reports.
8.	Obtain a clear understanding of annual report responsibilities.
9.	Spend extra effort on pelagic management unit species.
10.	Provide assistance to workshop participants.
11.	Obtain background to improve evaluation of existing programs.
12.	Develop a workable methodology for the thresholds.
13.	Explain and define annual report data requirements.
14.	Become familiar with issues.
15.	Achieve consensus on practical stock assessment methods.
16.	Obtain agreement on statistical tests for evaluating data.
17.	Obtain agreement on reporting and analytical procedures.
18.	Clarify most important monitoring criteria.
19.	Know the changes in annual report requirements.
20.	Clarify area-specific data requirements and responsibilities.
21.	Spend less time on annual reports and place more emphasis on long-term issues.

Table 4.--Continued.

22.	Know that what others think is important.
23.	Concentrate on the stocks and the fisheries.
24.	Identify method for getting cogent analyses.
25.	Streamline and standardize annual reports.

Table 5.--Lessons from stock assessment experience.

1.	Identify clearly the assessment objective.
2.	Understand the fleet dynamics of the fishery.
3.	Understand the bio-dynamics of the fish stocks.
4.	Critical and skeptical evaluation of assessment methods and data.
5.	Develop feedback loops between data, assessment methods, and objectives.
6.	Identify threshold values early in the fishery.
7.	Appreciate the uncertainty of values and data.
8.	Recognize the importance of a holistic approach, rather than just the pieces.

Table 6.--Key features of a fishery indicator approach.

1.	A framework based on the dynamics of the fishery is required.
2.	Data should be used regularly (or adequately stored and catalogued).
3.	Biological knowledge of the fish.
4.	Identify key indicators and assign priorities.
5.	Quality time-series data.
6.	Link indicators to their biological (or economic) meaning and to their "critical values."
7.	Link indicators to management objectives.
8.	Define the "problem" the indicator should reveal.
9.	Annual reports should not be annual data reviews.
10.	Identify the analyst who will use the indicator.

Table 7.--Final work products of the workshop.

1.	A "plan of attack" providing the relationship of each stage in the annual monitoring and assessment process with what needs to be done to facilitate that work.
	To be prepared by the Council staff
2.	Assessment and data matrix by area, identifying the responsible persons or agencies.
	To be prepared by the Council's staff in consultation with the FMP planning teams.
3.	Data needs document.
	To be prepared by the Council's staff.
4.	Workshop report (including preliminary report presented to Council in December).
	To be prepared by the facilitator.

Table 8.--Bottomfish Fishery Management Plan (FMP) indicators: (A) indicators revised by the bottomfish planning team, and (B) newly proposed indicators that were identified to supplement the indicators in (A) during the FMP Monitoring and Assessment Workshop on 6-9 November 1989.

A. Bottomfish FMP Indicators Revised by the Bottomfish Planning Team

Biological indicators

1. Average size of catch less than size at first maturity.
2. Ratio of fishing mortality to natural mortality greater than a critical value.
3. Current catch per unit effort (CPUE) is less than 50% that at the maximum sustainable yield (MSY) level or 20% of that at virgin biomass.

Economic indicators

4. Current harvest capacity exceeds that expected for MSY.
5. Revenue in the fishery is declining on a long-term trend.
6. There is either substantial entry to or exit from the fishery (indicating instability).
7. Annual vessel operating and fixed costs exceed ex-vessel revenue.

Operational indicators

8. Proportion of catch caught by a particular gear rises substantially.
9. Proportion of frozen product in the fishery rises substantially.
10. Total landings rise or decline substantially compared with a long-term trend.
11. Species composition changes substantially.

Table 8.--Continued.

Expert-based indicators

12. Research results indicate fishery problems.

13. Important habitat is destroyed or tainted.

14. Interactions between bottomfishing and protected species begin to occur.

B. Newly Proposed Bottomfish FMP Indicators Supplementing Indicators Identified in (A)

15. Relative spawning stock index.

16. Catch rates from hi-liner vessels used as markers.

17. Biomass of recruitment cohort.

18. Index of fishermen's confidence in resource status.

19. Ratio of male to female landings relative in size groupings.

20. Index of researcher confidence in resource status.

21. Travel time to fishable stocks grows substantially as a proportion of total time at sea.

22. Synopsis of overall size range of individual species.

23. Index of stock recovery after overfishing.

Table 9.--Potential indicators (ranked and unranked) for the Pelagic Species Fishery Management Plan (FMP).

Ranked indicators

1. Size statistics using length frequencies: mean, maximum, minimum.

2. Mr. Cruz index--an index of localized catchability based on the fishing experiences of the average small-boat fisherman in any particular area (1980 baseline).

3. Ratios of catch per unit effort (CPUE) by gear

4. Index of species-gear-season CPUE's (stratified by size class).

5. Recreational CPUE trends (including size trends).

6a. Pacific-wide catch and effort index (1980 baseline).

6b. Comparison of Pacific versus local abundance and effort.

6c. Price trends.

7. Index of effort by area and gear.

Table 9.--Continued.

Unranked indicators
8. Down-time index (index of time spent not at sea).
9. Travel time index (index of time at sea but not fishing).
10. Index of vessel participation (numbers of vessels).
11. Gear-species shares.
12. Neighboring area indexes of seasonal abundance (e.g., the Federated States of Micronesia).
13. Revenue by species-gear-season-area strata.
14. Ex-vessel revenue.
15. Development of a time-series standard.
16. Species composition by distance from shore.
17. Japanese historical data (catch and effort) by area.
18. Level of by-catch.
19. Time of fish residency in local waters.
20. Entry and exit patterns of vessels in fishery.
21. The CPUE gear ratios.

Table 10.--Possible items and approaches for the annual reports (not in any particular order).

1.	Annual reports to include all items included in the SAFE (i.e., stock assessment and fishery evaluation report; CFR 602 regulations) list.
2.	Annual reports to include only the high priority SAFE items.
3.	Annual reports to be limited to the minutes of the FMP planning team's discussion on the status of the fishery.
4.	Annual reports to be edited, 1- to 2-page versions of modules, concentrating on species summaries.
5.	Annual reports to be a formal plan monitoring team assessment of fishery condition.
6.	Annual reports to include individual "expert" commentaries by planning team members on the status of the fishery.
7.	Annual reports should continue the current practice of compiling individual modules and planning team recommendations.
8.	Annual reports should be limited to a consensus report on the planning team's annual review of the fisheries.
9.	Next annual review period should include detailed discussion of top priority indicators with an interactive process to develop new indicators.
10.	Planning teams should identify the "groundwork" needs for annual reviews.
11.	Annual reviews, with complete agendas, should be scheduled well in advance.
12.	Plan monitoring teams should examine the available data in light of potential indicators.
13.	A workshop should be held on island-area data analysis, similar to the South Pacific stock assessment workshop.
14.	Workshop "products" should be produced as soon as possible for guidance to the Council and plan monitoring teams.

Table 10.--Continued.

15.	Council/NMFS should provide stronger guidance for new persons in island areas or on Council committees.
16.	Planning teams should address the annual reviews and make recommendations for streamlining the process, including identifying a "suite" of potential indicators.

Table 11.--Commentary by the rapporteur of the FMP Monitoring and Assessment Workshop, which was held in Honolulu, Hawaii, on 6-9 November 1989.

General comments

1. The workshop was positively oriented with a high degree of cooperation and interaction among all participants.

2. The goals for the workshop (particularly in terms of "hands-on approach") were overly optimistic given the time constraints and number of participants. However, good progress was made towards achieving the general objectives.

3. The objective of defining data needs was not fulfilled by the workshop.

4. Indicators need to be placed into an analytical context.

5. Indicators cannot be defined in the abstract but need to be determined within the biological and operational context of a fishery to ensure that they will be feasible to produce as well as useful.

6. An individual or set of indicators, by itself, does not constitute a stock assessment. An assessment needs to synthesize all available information (which would include any indicators).

7. Data collection is only part of the problem in developing indicators and stock assessment. The analytical aspects require a substantial commitment of research time both for development and execution. There is a strong interrelationship and a need for feedback between these two aspects.

8. It was noted that none of the indicators discussed involved fishery-independent data (such as resource surveys).

9. Consideration should be given to sampling designs for catch and effort statistics targeting those portions of the fishery that make the largest contribution to the variances. Large improvements in estimates of total catch and effort and in developing a meaningful catch per unit effort index might be possible by concentrating sampling efforts in situations where a small proportion of the vessels are responsible for a high percentage of the total catch and effort.

Table 11.--Continued.

10.	The size of the fishery (e.g., volume and revenue) needs to be taken into account when considering data acquisitions and assessment activities. The cost of monitoring needs to be appropriately scaled to the value of the resource.
11.	Consideration should be given to having commercial fishing vessels (perhaps as part of licensing requirements) serve for short periods of time as research platforms (e.g., fish in randomly selected places) for collecting fishery assessment data (particularly where the small size of a fishery would prevent the use of dedicated research vessels).
Bottomfish	
12.	The bottomfish review should make significant progress in moving from qualitative approaches for indicators and assessments.
13.	Queried whether the spatial scale for assessment and management is appropriate.
14.	A healthy skepticism should be maintained towards models and assessment methods that require assumptions of equilibrium and stationarity.
15.	The sensitivity of indicators to recruitment variability needs to be considered when evaluating time trends (particularly short-term changes).
Pelagic species	
16.	Identified the importance of interacting with the South Pacific Commission (SPC) and the potential of the SPC regional data base for helping to address a number of the data, indicator, and assessment issues discussed (particularly with respect to Pacific-wide and regional indices of abundance).
17.	In planning and evaluation discussions, need to distinguish what is possible to do now versus what may be possible given a longer term perspective. Most, if not all, indicators require a long time series to be useful.
18.	Indicators need to be evaluated, ranked, and defined within the context of each individual fishery and region.

Table 12.--Next steps?
(Not in any particular order.)

1. Chairs of the plan monitoring teams should hold a joint meeting to consider the workshop results.

2. Each plan monitoring team should finish its indicators and identify fishery performance data requirements.

3. The Council and NMFS should devise a process for continuing this process of improving FMP monitoring, assessment, and reporting steps.

4. A more detailed, hands-on workshop on the key indicators should be held, using the available expertise.

5. Assistants should be identified for each island area to work with NMFS on stock assessments and data monitoring.

6. An NMFS research assistant should be identified to work with each island area's fishery agency on stock assessments and data monitoring.

7. A matrix of indicators, data needs, and agency responsibilities should be prepared.

8. Each FMP module should have fully specified indicator requirements.

WORKSHOP ANNOUNCEMENT

FMP MONITORING AND ASSESSMENT WORKSHOP

6-9 NOVEMBER 1989

NMFS HONOLULU LABORATORY CONFERENCE ROOM
HONOLULU, HAWAII

WHAT: A hands-on workshop to develop improved procedures for the Council's planning teams to monitor and assess the bottomfish and pelagic FMP's.

WHO: Convener: Ms. Kitty Simonds
Executive Director
Western Pacific Fishery
Management Council

Moderator: Samuel G. Pooley
Southwest Fisheries Center Honolulu Laboratory

Participants: Invited planning teams, SSC, and Council-affiliated scientists, and outside experts.

WHEN: 6-9 November 1989

WHERE: Honolulu Laboratory

WHY: The Council's Bottomfish and Pelagic FMP planning teams are required to prepare an annual report monitoring and assessing the respective fisheries in American Samoa, Guam, Hawaii, and the Commonwealth of the Northern Mariana Islands. Unfortunately, this has proven to be an extremely unwieldy task, both in terms of substantive content (presentation of monitoring data and assessments) and official responsibilities. This task is made even more important in light of the NOAA Fisheries' decision to move ahead on "thresholds" for each FMP fishery, and the tightening of annual report and assessment needs within the MFCMA national standards.

(continued)

Figure 1.--Announcement of the FMP Monitoring and Assessment Workshop, which was held 6-9 November 1989 in Honolulu, Hawaii.

The workshop will review the scientific basis for appropriate monitoring and assessment of these fisheries, compare that standard with existing data and methods, and propose a "plan of attack" for improving the preparation of future annual reports.

HOW: The workshop will be a combination of facilitated consensus methodologies, expert presentations, and hands-on experiments with monitoring and assessment capabilities.

The "hands-on" component will involve investigating the applicability of group-recommended "indicators" in terms of the availability of data and the ability of these data to be transformed through various analytical techniques into reliable and meaningful indicators of fishery performance. We will attempt to employ computer software packages in assessing example data sets.

The workshop will undoubtedly include substantial follow-up activity by the planning teams over the next year.

INPUTS: Each participant will be provided an agenda book containing relevant materials for the two FMP's.

NMFS WPACFIN will provide a microcomputer and computer programmer for the hands-on component of the workshop.

OUTPUTS: The workshop is designed to produce:

1) Consensual understanding of the FMP monitoring and assessment process.

2) Priorities for "indicators" in each fishery

(continued)

Figure 1.--Continued.

3) The first draft of a "plan of attack," which will identify the fiscal and personnel resources required to properly monitor and assess these fisheries and make recommendations for amending FMP annual reporting requirements. The plan of attack will be compiled by the Council, including input from each plan monitoring team at a later date.

4) The basic inputs into a revised "data needs document," which will identify in detail the data and analytical tools necessary to monitor and assess these fisheries. The data needs document will be compiled by the Council.

Figure 1.--Continued.

AGENDA

FMP MONITORING AND ASSESSMENT WORKSHOP
NOVEMBER 6-9, 1989

NMFS HONOLULU LABORATORY CONFERENCE ROOM
HONOLULU, HAWAII

Monday, November 6

8:30 am — Welcome and Introductions--Kitty Simonds, Western Pacific Fishery Management Council

8:45 am — Purpose of Workshop--Sam Pooley, Honolulu Laboratory

Ground rules--Pooley

Goals of participants--round table listing
What do you want to get out of this 4-day meeting?

Workshop objective (consolidated from above by consensus)

Agreement on agenda
Does the agenda match the objective?

9:30 am — South Pacific stock assessment workshop--Jeffrey J. Polovina, Honolulu Laboratory

10:30 am — Stock assessment and monitoring on the U.S. mainland --Tom Polacheck, Northeast Fisheries Center

11:30 am — Lessons from stock assessments--round table discussion

12:00 pm — Lunch

1:00 pm — Recent experiences in fisheries monitoring and assessment--round table listing
What one main fact or idea about the existing fishery monitoring and assessment process would you like to communicate to this group leading into the workshop?

(continued)

Figure 2.--Agenda of the FMP Monitoring and Assessment Workshop, which was held 6-9 November 1989 in Honolulu, Hawaii.

1:30 pm Monitoring criteria--an "indicator approach"--Paul Bartram, Western Pacific Fishery Management Council

2:00 pm Discussion of "indicators"--round table listing
What are the key features of an indicator?

2:45 pm Thresholds

-- Overview of threshold situation

-- Summary of PMT discussions
Walter Ikehara, Crustaceans
Dave Somerton, Bottomfish
Robert Skillman, Pelagics
Justin Rutka, Precious Corals

3:30 pm Final work products--Bunny Lowman, Western Pacific Fishery Management Council

4:00 pm Conclusion

Tuesday, November 7

Bottomfish FMP

8:30 am Stock assessment for Hawaii bottomfish--David A. Somerton, Honolulu Laboratory

9:30 am Moderated discussion of bottomfish annual report requirements--Sam Pooley, moderator

Identify and clarify important and useful fishery indicators for selected subsectors of these fisheries.

Agreement on agenda

9:45 am a) Review of Bottomfish FMP indicators and identify threshold indicators

10:00 am b) Description of basic bottomfish data and fishery problems in each area--participants

(continued)

Figure 2.--Continued.

11:00 am	c)	Choice of fishery for further analysis--consensus
	d)	Agreement on proposed criteria for evaluating indicators--discussion
11:15 am	Lunch	
12:15 pm	e)	Analysis of first indicator using proposed criteria
1:30 pm		Continue with next indicator(s)
2:30 pm	f)	Identify new indicator(s)--round table listing
3:00 pm	g)	Discussion of differences between areas
3:15 pm	h)	Proposed recommendations for amending FMP reporting requirements--round table listing
		What do we need to do about the bottomfish annual report?
5:00 pm	Conclusion	

Wednesday, November 8

Pelagics FMP

8:30 am	Status of PMUS stock assessment--Robert A. Skillman, Honolulu Laboratory
9:30 am	Moderated discussion of bottomfish annual report requirements--Sam Pooley, moderator
	Identify and clarify important and useful fishery indicators for selected subsectors of these fisheries.
9:30 am	a) Description of basic pelagic fishery problems in each area--participants

(continued)

Figure 2.--Continued.

10:30 am	b)	Review of Pelagic FMP data reporting elements and SAFE document requirements--discussion
11:00 am	c)	Identification of (new) indicator(s)--round table listing
11:30 am	d)	Clarification of indicators--discussion
11:45 am	e)	Prioritization of indicators--voting
12:00 pm	Lunch	
1:00 pm	f)	Choice of fishery for further analysis--consensus
	g)	Review of indicator criteria
1:15 pm	h)	Analysis of first indicator
2:00 pm		Continue with next indicator(s)
3:30 pm	i)	Discussion of differences between areas
4:00 pm	j)	Proposed recommendations for amending FMP reporting requirements--round table listing
		What do we need to do about the annual reports?
4:30 pm	Conclusion	

Thursday, November 9

8:30 am	Review of previous days' work
	Conclusion to annual report discussion
9:30 am	Explanation of final work products--Lowman
10:15 am	Rapporteur's commentary and discussion--Polacheck
11:15 am	What's next? Elements for the "plan of attack"--round table listing
11:45 am	Wrap up and evaluation
12:00 pm	Workshop completed

Figure 2.--Continued.

Country	Estimated MSY (t/year)	Landings (t/year)	F/year
Tonga	77-222	391	0.38
Western Samoa	17-50	25	(*)
Fiji			
Current fishing area of 500 nmi of 200 m habitat now being fished	70-200	300	0.12
Potential fishing area of 3,000 nmi	426-1,280	0	0.00
Papua New Guinea	170-270	0	0.00
Vanuatu	113-190	40	0.07

(*) No Estimate of q available to estimate F.

Figure 3.--Summary of the South Pacific stock assessment: Estimates of maximum sustainable yield (MSY), the 1988 landings, and the 1988 estimated fishing morality (F) for deepwater snappers at selected Pacific island countries (from Polovina in prep.).

STOCK ASSESSMENT SYSTEMS MODEL

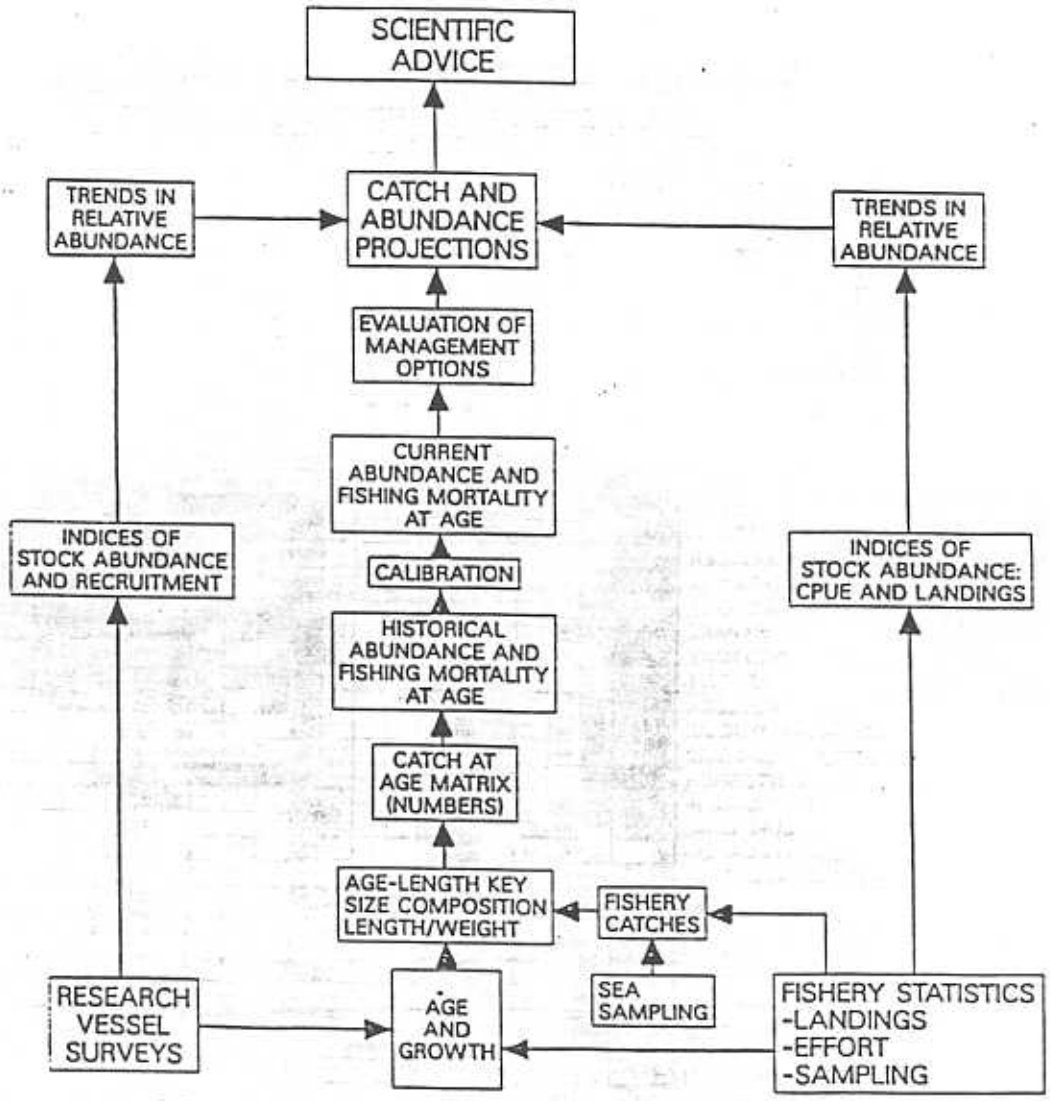

Figure A. Diagram of alternate ways in which fishery-generated data and research data (lower right and left boxes, respectively) are combined to provide scientific advice on the status of stocks (top box).

Figure 5.--Northeast Fisheries Center stock assessment flow-chart.

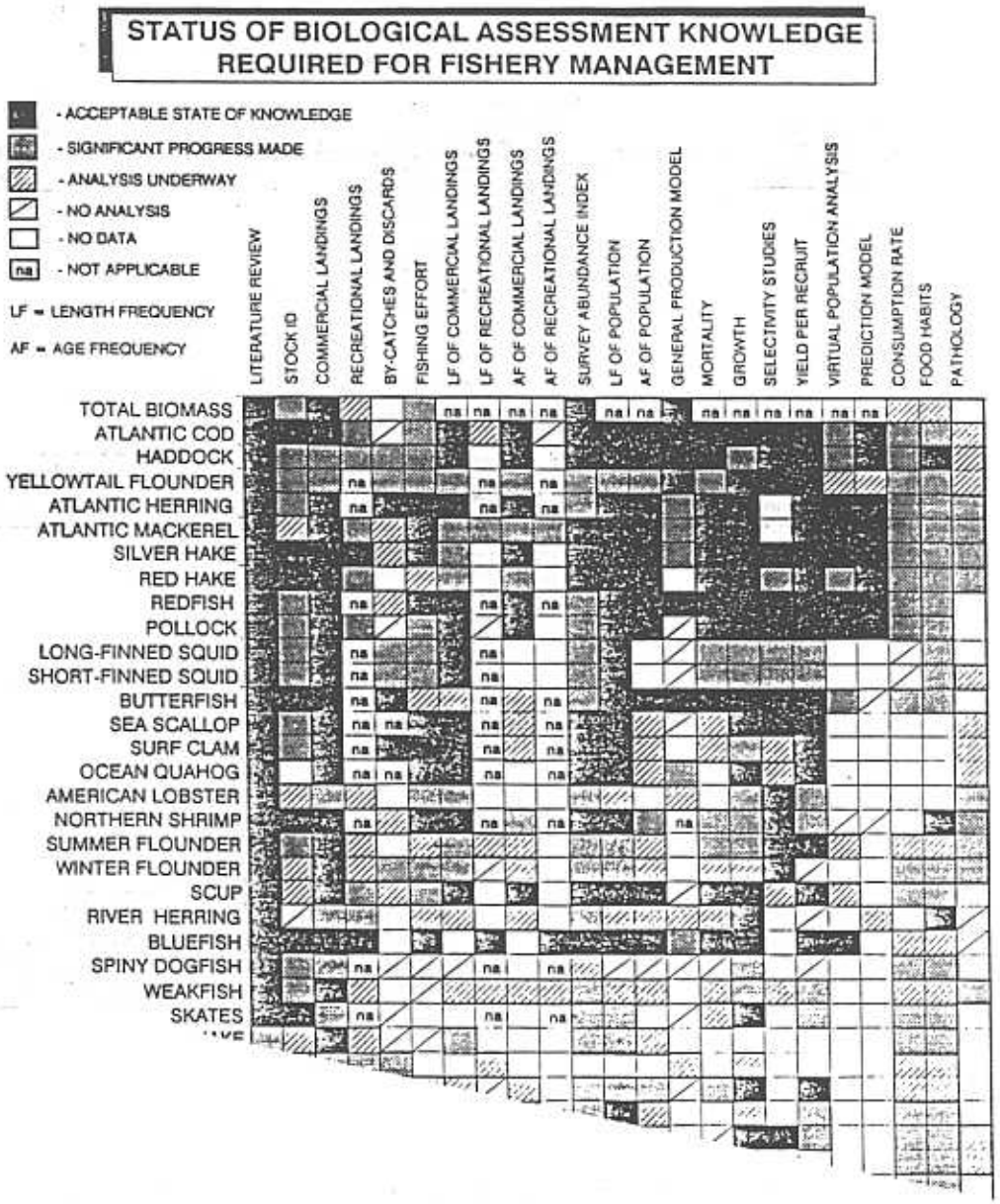

Figure 6.--Northeast Fisheries Center data matrix.

Bottomfish and Seamount Groundfish

Overfishing from a threshold point of view would be defined when both of the following two conditions are met, and a warning situation would pertain to one of the conditions being met:

1. Average size of catch is less than size at first maturity.

2. Current CPUE (catch per unit effort) is at least 50% that at the maximum sustainable yield (MSY) levels of stock abundance or 20% of that at virgin biomass.

The Bottomfish FMP will be amended according to this scheme.

The seamount groundfish fishery is closed until 1992.

Crustaceans (Lobster)

Overfishing from a threshold point of view is precluded by the nature of the Crustacean FMP as currently written and by the operational logistics of the fishery. The Crustacean FMP has a size limit based on size at first maturity and escape gaps to improve survivability of those sizes. The fishery is based on "distant-water" operations where economic viability is expected to decline much more rapidly than overall lobster stocks.

The plan monitoring team has prepared a request for consistency with the new regulations.

Pelagic Species

Overfishing from a threshold point of view is not operationally possible within the U.S. exclusive economic zone in Pacific, since most pelagic species are considered Pacific-wide stocks. Less than 5% of any particular pelagic species is caught within U.S. waters. Therefore, biological management on a national basis is pointless, although national management measures for allocation purposes are important considerations (not pertinent to the threshold issue) and international management for biological objectives is a major goal of the Pelagic Species FMP.

(continued)

Figure 7.--Threshold recommendations (summarized from the Council's plan monitoring teams).

The plan monitoring team has prepared a request for exemption from the new regulations.

Precious Corals

Overfishing from a threshold point of view would be defined by the relationship of mature sized coral colonies to total standing stock. Measuring this through actual fishing operations would be extremely difficult, so fishery-independent means may be required. At present, the precious coral fishery is inactive, as unpermitted fishing by foreign companies has apparently diminished the known coral beds.

The plan monitoring team will prepare an amendment to the FMP to develop a framework approach to defining MSY and optimum yield, and will incorporate the new threshold definition into the FMP.

Figure 7.--Continued.

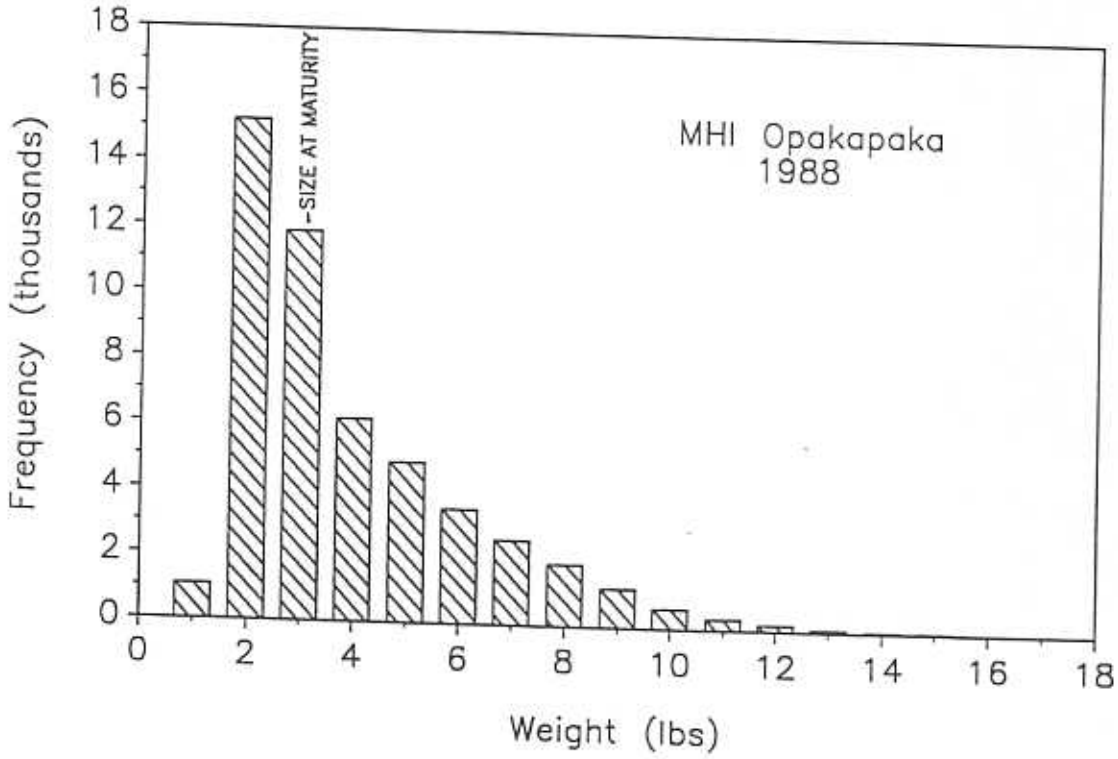

Figure 8.--Bottomfish stock structure (from Somerton et al. 1989). This figures indicates the kind of size composition work currently included in the bottomfish annual reports. Simulation of these size frequencies through time was the objective of Somerton's research for the FMP workshop.